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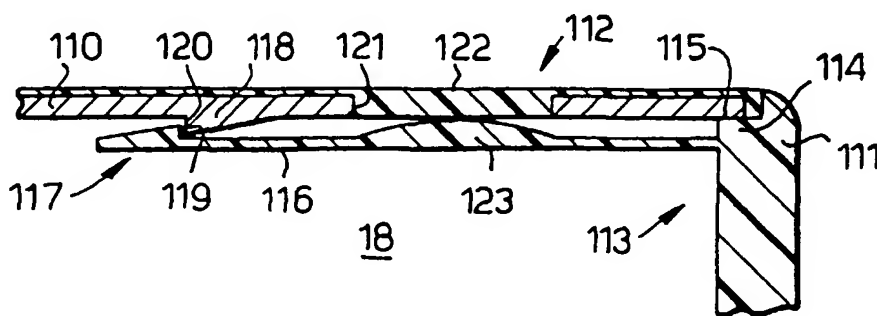
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(54) Title: TOOTHBRUSH



(57) Abstract: An electric battery-driven toothbrush in which the handle has a battery compartment with a closure, and the closure is retained by a catch which is operable by application of an operating force thereto. The handle wall includes a flexible region adjacent to the catch means which can be deformed inwardly by pressure applied to the flexible region, the inwardly deforming

region consequently bearing on the catch means to apply the operating force. The invention also provides a separate handle for this toothbrush.

## Toothbrush

This invention relates to toothbrushes. In particular the invention relates to electric toothbrushes which comprise a handle containing an electric drive motor powered by one or more replaceable battery contained in a compartment in the handle. Specifically the invention relates to a closure for the battery compartment of such a toothbrush.

Electric toothbrushes of this general type are known. Typically the handle is elongate and at one end has a head section including a driveable brush. Normally the head section is replaceably connectable to the handle. When such electric toothbrushes are driven by one or more replaceable battery, which may be a disposable battery which is disposed of when used up, or a rechargeable battery which needs to be removed from the handle for recharging, such one or more batteries are normally enclosed within a battery compartment within the handle with an opening for insertion and/or removal of the battery/ies. Such an opening is provided with a closure. Such a closure should be secure against the stresses encountered during use of the toothbrush, and should provide a seal against ingress of environmental water, as liquid or vapour. Also being a consumer article such a closure should be easy to operate whilst being secure. Present closures for the battery compartments of electric toothbrushes are not optimised. Some are an awkward friction fit, or a screw fit requiring excessive effort or the insertion of a coin etc. into a slot to operate the screw thread.

A number of closures for battery compartments of products such as electric toothbrushes are for example known from US-A-5401591, US-A-5283921 and US-A-4371584.

It is an object of this invention to provide an improved closure for the battery compartment of an electric toothbrush and consequently an improved electric toothbrush. Other objects will be apparent from the description.

According to this invention an electric battery-driven toothbrush is provided comprising:

a handle containing an electric drive motor capable of being powered by one or more replaceable batteries and a head section including a brush which is driveable by the motor, the handle being defined by a handle wall, the handle

having a compartment therein for the containment of one or more replaceable batteries, and having an opening for the insertion and removal of said one or more batteries, the opening having a closure which may be moved in and out of a closing relationship with the opening, wherein:

5           the closure is retainable in a closing relationship with the opening by a catch means which can be operated by the application of an operating force thereto to thereby release the closure and allow the closure to be moved out of the closing relationship with the opening,

          and the handle wall includes a flexible region adjacent to the catch means,  
10       and which can be deformed inwardly by pressure applied to the flexible region, the inwardly deforming region bearing on the catch means to apply operating force thereto.

The present invention also provides a handle suitable for use with such a toothbrush, and to which a replaceable head may be connected.

15           Therefore according to another aspect of this invention there is provided a handle for an electric battery driven toothbrush, containing an electric drive motor capable of being powered by one or more replaceable batteries, being connectable to a replaceable head section including a driveable brush, the handle being defined by a handle wall, the handle having a compartment for the containment therein of  
20       one or more replaceable batteries, and having an opening for the insertion and removal of said one or more batteries, the opening having a closure which may be moved in and out of a closing relationship with the opening, wherein:

          the closure is retainable in a closing relationship with the opening by a catch means which can be operated by the application of an operating force thereto to  
25       thereby release the closure and allow the closure to be moved out of the closing relationship with the opening,

          and the handle wall includes a flexible region adjacent to the catch means, and which can be deformed inwardly by pressure applied to the flexible region, the inwardly deforming region consequently bearing on the catch means to apply  
30       operating force thereto.

Suitably the handle is an elongate structure, having the battery compartment at the end thereof remote from the head section. Preferably the battery compartment

is at least in part surrounded by the handle wall, and preferably the opening is defined by an end opening of the handle facing in the longitudinal head-handle direction, and the closure comprises an end cap or an end plug which fits over or into this end opening to close it.

5           The catch means may be any operable mechanism which in one configuration acts to retain the closure in the closing relationship and by application of the operating force converts to another configuration in which it does not act to retain the closure in the closing relationship.

10           A preferred catch means comprises a resilient leaf extending from the closure in a direction which when the closure is in place extends into the interior of the handle, e.g. into the battery compartment, and having a first catch part thereon which engages with a second catch part in the handle, e.g. on the inner surface of the handle wall where this bounds the battery compartment, to retain the closure in the closing relationship, this leaf being adjacent to the flexible region, so that the  
15           operating force applied via the flexible part causes the leaf to bend against its resilience to disengage the first and second catch parts.

For example the first and second catch parts may be respectively longitudinally arranged abutment parts, that on the leaf hooking behind, i.e. further from the closure, than that on the handle.

20           Suitably the flexible part may bear directly upon the catch means, but alternatively there may be intermediate force transmission parts or mechanisms between the flexible part and the catch means via which operating force may be communicated from the flexible part to the catch means, so that the flexible part bears indirectly on the catch means.

25           The flexible region may be provided by various constructions. For example this flexible region may be a resilient part of the handle wall, e.g. made of the wall material. The flexible part may comprise one or more bellows parts of the wall material. In a preferred construction the handle wall is made of a rigid plastic material such as polypropylene or polystyrene, and the flexible part is provided by  
30           an aperture in the handle wall which is closed by a flexible diaphragm of an elastic, e.g. elastomeric or other rubbery material. This diaphragm may be deformed by pressure applied to it by the user, causing part of it to deform inwardly into the

space within the handle wall, and this part may bear upon the catch means to apply operating force to the catch means to thereby release the catch means. Suitably such an aperture may comprise a "window" through the wall material, wholly closed by the diaphragm.

5        Such a diaphragm may be formed by a process of injection moulding.

Typically in such a process the handle wall is first made, e.g. of plastic materials, in a first injection moulding step, the handle wall incorporating the aperture. The so-formed handle wall may then be enclosed in a second mould, and then the diaphragm may be formed in a second injection moulding step. Processes in which  
10    toothbrushes are made in sequential injection moulding steps in which firstly plastic material parts are made, then rubbery material parts are made in a second injection moulding step are well known in toothbrush manufacture. Such a process is for example disclosed in WO 94/05183.

The invention therefore provides an injection moulding process by which a  
15    toothbrush as described above may be manufactured, in which the handle wall is first made of plastic materials in a first injection moulding step, and then the diaphragm is formed in a second injection moulding step.

The invention therefore also provides an injection mould suitable for use in such a process.

20        Other parts of the toothbrush of the invention, e.g. the battery connection parts by which the battery/ies within the compartment, controls e.g. on/off switches, motor etc., may be entirely conventional.

The toothbrush of this invention will now be described by way of example only with reference to the accompanying Figures 1 and 2.

25        Fig. 1 shows the overall arrangement of an electric toothbrush of this invention.

Fig. 2 shows a close-up section through the junction between the battery compartment closure and the battery compartment of the toothbrush of Fig. 1.

Referring to Fig. 1, this shows generally 10 an electric toothbrush in side  
30    view 10. The toothbrush 10 comprises a handle 11 by which it may be held, and which includes a drive motor, batteries, controls etc. (not shown). The handle 11 is replaceably connected at connection 12 to a replaceable head section 13. The head

section includes a head 14 at the head end of the section 13 remote from handle 11 and a hollow tubular body 15. The body 15 is engageable with the handle 11 at the connection 12. The assembly of handle 11, replaceable section 13 and head 14 are disposed along the head-handle length direction A--A of the toothbrush 10. In the head 14 is mounted a driveable brush 16, from which a cluster of bristles 17 extend. The brush 16 is driven by the motor (not shown) via a drive shaft (not shown generally) extending along inside the hollow tubular body 15.

The handle 11 is an elongate structure with the brush section 13 replaceably attached at one end. Within the handle 11 is a compartment 18 for batteries 19. This compartment 18 is open at the opposite end of the handle 11 to that at which the head section 13 is attached and is bounded by a compartment wall 110 corresponding to the handle wall. The open end of the compartment 18 is closed by a closure 111 which is in the form of an end plug which fits by a tight friction fit into the open end of the compartment 18. The battery compartment 18 and the closure 111 incorporate electrical connections etc. of a conventional type to enable an electrical connection to be made between the batteries 19 and the motor (not shown).

As shown in Fig. 1 the closure may be moved longitudinally relative to the handle 11 to remove it from its closing relationship with the opening. This removal is against the friction of the fit between the closure 111 and the compartment wall 110. Also the closure is provided with a catch means 112 as shown more clearly in Fig. 2. When the closure 111 has been removed from the opening, batteries 19 can be removed from, inserted in or replaced in the battery compartment 18.

Fig. 2 shows the handle 11 in the vicinity of its open end in more detail with the closure 111 and catch means 112.

In Fig. 2A the handle wall 110 is shown in longitudinal section, surrounding and enclosing the battery compartment 18 within the handle around its lateral sides. Batteries 19 are not shown. The battery compartment 18 has an open end 113, being the open end of the handle 11 facing generally in the longitudinal direction away from the head 14. Closure 111 can be inserted into and fits into the open end 113 of the battery compartment 18 in the manner of a plug, having a plug part 114 which engages in a conveniently tight friction fit with the rim 115 of the open end 113 of

the open end of compartment 18. Though shown solid in Fig. 2 the plug part 114 may of course have other constructions, for example being defined by a tubular skirt wall externally corresponding to the internal profile of the opening of the battery compartment 18 so as to fit therein.

5        Extending longitudinally inwardly into the battery compartment 18 from the closure 111 is a catch part comprising a flexible resilient leaf 116 made integrally with the plastic material of closure 111. With the closure 111 in place on the handle 11 the leaf 116 extends into the interior of the handle, 11, i.e. into the battery compartment 18. At its extreme inward end the leaf 116 is formed into a wedge  
10    shape 117. Adjacent to the wedge shape 117 when this is inserted into the open end 113 is a corresponding catch part in the form of a wedge shape 118 on the inner surface of the wall 110. The wedge shapes 117, 118 are shaped oppositely so that shape 117 can smoothly ride over shape 118 when the closure 111 is inserted into the open end 113, and an abutment surface 119 on wedge 117 can fit behind  
15    abutment surface 120 on wedge 118, so that the closure 111 is thereby restrained from being removed longitudinally from open end 113.

Adjacent to the leaf 116 is an aperture 121 passing completely through the plastics material of the wall 110. This aperture 121 is completely closed by a diaphragm 122 of a rubbery material, for example a thermoplastic elastomer.

20        As shown in Fig. 2B, the diaphragm 122 is deformable by pressure applied from the outside of the handle 11, for example by the finger of the user applied in the direction of the arrow. The inwardly-deformed diaphragm 122 bears upon the leaf 116, and a bulge 123 is formed in the surface of the leaf 116 facing the underside of the diaphragm 122 to facilitate this. The bearing of the diaphragm 122  
25    onto the leaf 116 applies operating pressure to the leaf 116 causing the leaf 116 to bend as shown, so that the surfaces 119 and 120 are no longer in abutment, so that the closure 111 can be removed longitudinally in the direction of the arrow as shown in Fig. 2C.

With the closure 111 removed from the opening as shown in Fig. 1B and  
30    Fig. 2C batteries 19 can be removed from or inserted into battery compartment 18 in handle 11.

The closure 111 may easily be re-inserted into the open end 113 of the battery compartment 18 by a reverse longitudinal motion. The wedge shaped surfaces 119, 120 ride over each other in a ramp manner until the wedge shape 119 "snaps" behind the part 120 to return the catch means into the configuration as shown in Fig. 2A.

Fig. 1C shows a view of the end part of the handle 11 in the vicinity of the open end 113 and closure 111, rotated through 90° relative to Fig. 1A, showing the leaf 116 in plan view. It is also shown that the membrane 122 forms part of a larger area 124 of rubbery material forming a grip-enhancing pad on the handle 11, and on which the position of the aperture 121 is marked, e.g. with a surrounding rim, a symbol, or other marking. It is also seen in Fig. 2 that the rubbery material is extended around the rim of the open end 113 to form a seal 125 which helps to prevent ingress of for example environmental water into the battery compartment 18 and/or to the motor (not shown).

The handle 11 also includes conventional controls 126 such as an on-off switch etc. of generally conventional type.



**Claims:**

1. An electric battery-driven toothbrush comprising:

a handle containing an electric drive motor capable of being powered by one  
5 or more replaceable batteries and a head section including a brush which is  
driveable by the motor, the handle being defined by a handle wall, the handle  
having a compartment for the containment therein of one or more replaceable  
batteries, and having an opening for the insertion and removal of said one or more  
batteries, the opening having a closure which may be moved in and out of a closing  
10 relationship with the opening, wherein:

the closure is retainable in a closing relationship with the opening by a catch  
means which can be operated by the application of an operating force thereto to  
thereby release the closure and allow the closure to be moved out of the closing  
relationship with the opening,

15 and the handle wall includes a flexible region adjacent to the catch means,  
and which can be deformed inwardly by pressure applied to the flexible region, the  
inwardly deforming region consequently bearing on the catch means to apply  
operating force thereto.

20 2. A toothbrush according to claim 1 wherein the handle is an elongate  
structure, having the battery compartment at the end thereof remote from the head  
section, the opening is defined by an end opening facing in the longitudinal head-  
handle direction, and the closure comprises an end cap or an end plug which fits  
into or over this end opening to close it.

25 3. A toothbrush according to claim 1 or 2 wherein the catch means is an  
operable mechanism which in one configuration acts to retain the closure in the  
closing relationship and by application of the operating force converts to another  
configuration in which it does not acts to retain the closure in the closing  
30 relationship.

4. A toothbrush according to any one of claims 1, 2 or 3 wherein the catch means comprises a resilient leaf extending from the closure and having a first catch part thereon which engages with a second catch part in the handle to retain the closure in the closing relationship, this leaf being adjacent to the flexible region, so  
5 that the operating force applied via the flexible part causes the leaf to bend against its resilience to disengage the first and second catch parts.

5. A toothbrush according to any one of claims 1 to 4 wherein the flexible region is a resilient part of the handle wall.

10 6. A toothbrush according to any one of claims 1 to 5 wherein the flexible part is provided by an aperture in the handle wall which is closed by a flexible diaphragm of an elastic material which may be deformed by pressure applied to it by the user, causing part of the diaphragm to deform inwardly into the space within  
15 the handle wall, so that the part bears upon the catch means to apply operating force to the catch means.

7. A handle for an electric battery driven toothbrush, containing an electric drive motor capable of being powered by one or more replaceable batteries, being  
20 connectable to a replaceable head section including a driveable brush, the handle being defined by a handle wall, the handle having a compartment for the containment therein of one or more replaceable batteries, and having an opening for the insertion and removal of said one or more batteries, the opening having a closure which may be moved in and out of a closing relationship with the opening,  
25 wherein:

the closure is retainable in a closing relationship with the opening by a catch means which can be operated by the application of an operating force thereto to thereby release the closure and allow the closure to be moved out of the closing relationship with the opening,

30 and the handle wall includes a flexible region adjacent to the catch means, and which can be deformed inwardly by pressure applied to the flexible region, the

inwardly deforming region consequently bearing on the catch means to apply operating force thereto.

8. A handle according to claim 7 being an elongate structure, having the battery compartment at the end thereof remote from the head section, the opening is defined by an end opening facing in the longitudinal head-handle direction, and the closure comprises an end cap or an end plug which fits into or over this end opening to close it.

9. A handle according to claim 7 or 8 wherein the catch means is an operable mechanism which in one configuration acts to retain the closure in the closing relationship and by application of the operating force converts to another configuration in which it does not acts to retain the closure in the closing relationship.

10. A handle according to any one of claims 8, 9 or 10 wherein the catch means comprises a resilient leaf extending from the closure and having a first catch part thereon which engages with a second catch part in the handle to retain the closure in the closing relationship, this leaf being adjacent to the flexible region, so that the operating force applied via the flexible part causes the leaf to bend against its resilience to disengage the first and second catch parts.

11. A toothbrush according to any one of claims 7 to 10 wherein the flexible region is a resilient part of the handle wall.

12. A handle according to any one of claims 7 to 11 wherein the flexible part is provided by an aperture in the handle wall which is closed by a flexible diaphragm of an elastic material which may be deformed by pressure applied to it by the user, causing part of the diaphragm to deform inwardly into the space within the handle wall, so that the part bears upon the catch means to apply operating force to the catch means.

Fig.1A.

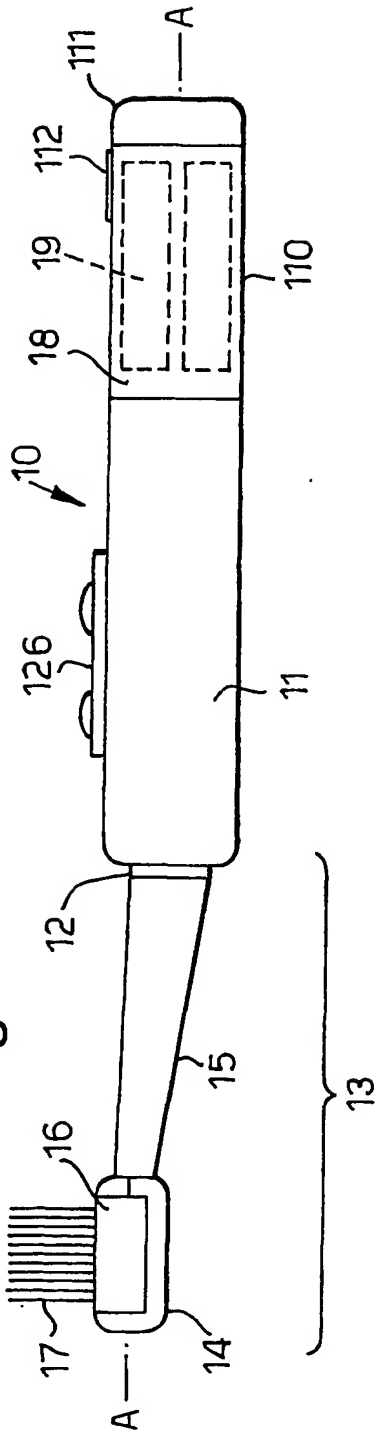


Fig.1B.

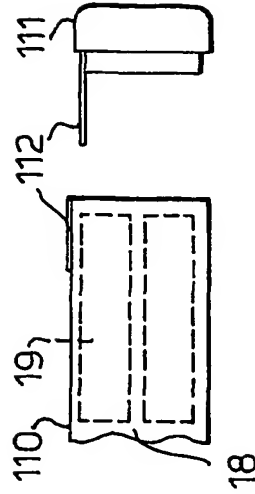
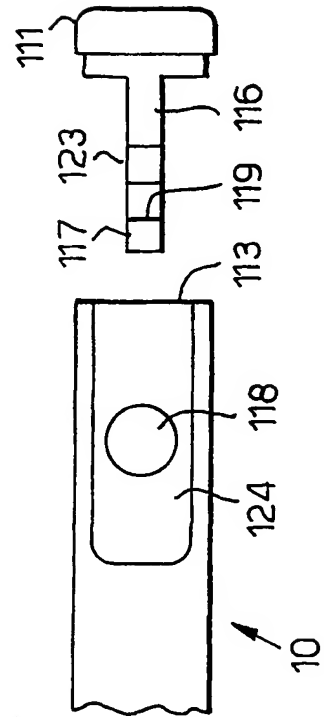


Fig.1C.





A. CLASSIFICATION OF SUBJECT MATTER  
 IPC 7 A61C17/22 H05K5/00 H01M2/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 750 888 A (OKADA EIJI) 2 January 1997 (1997-01-02) column 16, line 14 -column 17, line 22; figures 49,59,61,69	1-3,5-9, 11,12
Y	PATENT ABSTRACTS OF JAPAN vol. 1998, no. 08, 30 June 1998 (1998-06-30) & JP 10 069895 A (NEC SHIZUOKA LTD), 10 March 1998 (1998-03-10)	1-3,5-9, 11,12
A	abstract	4,10
A	US 5 401 591 A (BISHAY JON M ET AL) 28 March 1995 (1995-03-28) cited in the application column 3, line 39-63; figure 2	3,4,7,9, 10
	-/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3 255 637 A (BOYLES ROBERT L) 14 June 1966 (1966-06-14) column 3, line 61-72; figure 3 ---	4-6, 10-12
A	US 5 283 921 A (NG POON-KEE G) 8 February 1994 (1994-02-08) cited in the application column 3, line 10 -column 4, line 10; figure 7 ---	1,3,7,9
A	GB 978 883 A (GEN ELECTRIC) 23 December 1964 (1964-12-23) the whole document -----	3,4,9,10

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
EP 0750888	A	02-01-1997	JP	9010243 A	14-01-1997
			JP	9168554 A	30-06-1997
			US	5706542 A	13-01-1998
JP 10069895	A	10-03-1998	JP	3088300 B	18-09-2000
US 5401591	A	28-03-1995	NONE		
US 3255637	A	14-06-1966	NONE		
US 5283921	A	08-02-1994	GB	2255901 A	25-11-1992
			JP	5154016 A	22-06-1993
GB 978883	A	23-12-1964	CH	405232 A	15-01-1966